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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/576,004

04/17/2006

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EXAMINER

BITAR, NANCY

ART UNIT

PAPER NUMBER

2624

MAIL DATE

DELIVERY MODE

10/07/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/576,004	Applicant(s) THIELEMANS, KRIS FILIP JOHAN JULES	
	Examiner NANCY BITAR	Art Unit 2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 April 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 April 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>4/17/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Examiner Notes

1. Examiner cites particular columns and line numbers in the references as applied to the claims below for the convenience of the applicant. Although the specified citations are representative of the teachings in the art and are applied to the specific limitations within the individual claim, other passages and figures may apply as well. It is respectfully requested that, in preparing responses, the applicant fully consider the references in entirety as potentially teaching all or part of the claimed invention, as well as the context of the passage as taught by the prior art or disclosed by the examiner.

Information Disclosure Statement

2. The information disclosure statement filed 17/4/2006 fails to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been considered. The reference Qi J et al " Correction of Motion in PET using event based rebinning method, pitfall solution" has not been considered because the NPL submitted is only the Objective of the article rather than the whole article.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly

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connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claim 10 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. The limitation "using an analytic image reconstruction algorithm and/or an analytic rebinning algorithm," does not have enablement in the specs where three embodiment that explains the use of image reconstruction algorithm by itself, the use of rebinning algorithm only and the combination of both by performing image reconstruction using an analytic image reconstruction algorithm and/or an analytic rebinning algorithm.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows:

Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.

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When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and *Warmerdam*, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).

In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See *Lowry*, 32 F.3d at 1583-84, 32 USPQ2d at 1035.

5. Claim(s) 14-15 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claims 14 defines a “computer software” embodying functional descriptive material. Claims 15 define a “data carrier” embodying functional descriptive material. However, the claim does not define a computer-readable medium or memory and is thus non-statutory for that reason (i.e., “When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized” – Guidelines Annex IV). That is, the scope of the presently claimed “computer software and a data carrier” can range from paper on which the program is written, to a program simply contemplated and memorized by a person. The examiner suggests amending the claim to embody the program on “computer-readable medium” or equivalent in order to make the claim statutory. Any amendment to the claim should be commensurate with its corresponding disclosure.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) The invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 9-16 are rejected under 35 U.S.C. 102(b) as being anticipated by “The design and implementation of a motion correction scheme for neurological PET, Bloomfield et al , 2003)

As to claim 1, Bloomfield et al. teaches a method of conducting motion correction for a tomographic scanner including a detector array for detecting radiation to generate detector data, wherein the method comprises: storing detector data collected during a data acquisition period (Each record contains the singles polling time stored in millisecond relative to the start of acquisition, the number of samples and the detector singles rate, section 2.1 , said detector data being indicative of: i) directions along which radiation is detected ; and ii) quantities of radiation detected in different of said directions (From the point source measurements, the FWHM at each axial position was 7.1 mm in the horizontal direction, and increasing from 4.7 mm at the 0 mm position, to 4.8 mm, 20 mm offset, in the vertical direction, abstract); storing movement data representing movement of the subject during the data acquisition period (section 2.2) ; and motion correcting said detector data using said movement data and a motion correction algorithm

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to calculate motion corrected detector data, wherein said motion correcting step comprises processing said detector data(motion correction, section 3) by:

a) realigning directions of at least some of said detector data on the basis of said movement data (The appropriate motion correction for the lor is determined from the motion tracking data and the vectors are rotated using quaternion mathematics (appendix). The corrected vectors are then converted back to sinogram bin element positions for updating the sinogram. This is repeated for all lor in the list mode file, page 965, lines 6-18); and

b) altering quantities of at least some of said detector data on the basis of said movement data, such that at least some of said detector data are both realigned and altered in quantity, wherein said altering quantities step comprises calculating estimates of first detector data based on second, different, detector data (page 965, lines 6-26; note that the calculating estimates of first detector data based on second, different, detector data, is already contained in the motion correction step of the sinogram depending on the value of the raw(pre-alignment) sinogram at another radial and angular position).

As to claim 9, Bloomfield et al. teaches a method according to claim 1, further comprising performing image reconstruction using said motion corrected detector data (A method has been developed to accurately monitor the motion of the head during a neurological PET acquisition, and correct for this motion prior to image reconstruction, abstract, and Introduction section 1).

As to claim 10, Bloomfield et al. teaches a method according to claim 9, comprising performing image reconstruction using an analytic image reconstruction algorithm and/or an analytic rebinning Algorithm (The corrected sinogram data are rebinned into 2D sinograms using

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a Fourier rebinning (FORE) algorithm (Defrise 1995), prior to reconstruction with a 2D filtered back projection algorithm with either a Ramp or Hann filter at Nyquist cut-off frequency, section 3).

As to claim 11, Bloomfield et al. teaches a method according to claim 10, wherein said algorithm is one of 3DRP, FAVOR, BPF, FORE, FORE-X and FORE-J (The corrected sinogram data are rebinned into 2D sinograms using a Fourier rebinning (FORE) algorithm (Defrise 1995), prior to reconstruction with a 2D filtered back projection algorithm with either a Ramp or Hann filter at Nyquist cut-off frequency, page 965, lines d30-33).

As to claims 12 and 13, Bloomfield et al. teaches a method according to claim 1, wherein said scanner is a positron emission tomography (PET) scanner (PET, abstract and Introduction section 1) and wherein detector data is 3D PET detector data (Exact 3D, section 2.1) .

The limitation of claims 14-16 has been addressed in claim 1 above

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bloomfield et al in view of Lee K.J. et al “ Use of forward projection to correct patient motion during SPECT Imaging”

While Bloomfield et al.meets a number of the limitations of the claimed invention, as pointed out more fully above, Bloomfield et al. fails to specifically teach the use of forward projection for motion correction on tomographic scanner data. Specifically, Lee K J et al. teaches the Reconstruction of consistent tomographic images requires an iterative process. There are in fact two iterative loops in the correction process proposed here. Initially all the data are reconstructed to form a set of axial images and these are forward projected (section 2.2). It would have been obvious to one of ordinary skill in the art to use the forward projection in motion correction of Bloomfield in order to expect high accuracy and reduce computation time .Therefore; the claimed invention would have been obvious to one of ordinary skill in the art at the time of the invention by applicant.

9. Claims 3-4, 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bloomfield et al in view of Nutt et al (US6,6630,284)

While Bloomfield et al.meets a number of the limitations of the claimed invention, as pointed out more fully above, Bloomfield et al. fails to specifically teach the rescaling quantities. And the method comprises altering a quantity to take into account both a said calculated estimate and a said rescaled quantity, selectively utilizing a said calculated estimate or a said rescaled quantity to generate a said altered quantity on the basis of a variable threshold and wherein a value indicating an amount of scaling deemed appropriate for a quantity is determined, and the value is compared to the threshold in order to determine whether to scale the quantity

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upwards or to replace it with a calculated estimate. Specifically, Nutt et al teaches CT images are reconstructed on the CT acquisition computer and then transferred to the PET console. The CT images are used to generate the attenuation correction factors. Specifically, the attenuation image at 511 keV is estimated by first using a threshold to separate out the bone component of the CT image, and then using separate scaling factors for the bone and non-bone component. These factors are applied after scatter correction to the PET emission data to correct for attenuation, and the PET images are then reconstructed using a Fourier rebinning technique (FORE) and then independently by the ordered-subset EM (OSEM) iterative reconstruction algorithm (FORE+OSEM). (see figures 9A-9C),Moreover, Nutt et al teaches attenuation correction factors along oblique LOR's are obtained by forward projection through the segmented and scaled CT images. An illustrative example is shown in FIGS. 5A, 5B and 5C. The original CT image is shown in FIG. 5A, and the corresponding image after segmentation and scaling to 511 keV is shown in FIG. 5B. These figures illustrate the considerable detail that is preserved at the higher energy after scaling. Such detail is generally not visible on PET transmission images, illustrated in FIG. 5C, owing to the high level of statistical noise, even with cesium transmission sources (abstract; column 17, lines 12-column 18, lines 50). It would have been obvious to one of ordinary skill in the art to use the rescaling in the motion correction of Bloomfield in order to avoid the noise artifacts due to the rescaling of the LOR having very low reading expect high accuracy and reduce computation time .Therefore; the claimed invention would have been obvious to one of ordinary skill in the art at the time of the invention by applicant.

Conclusion

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10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to NANCY BITAR whose telephone number is (571)270-1041.

The examiner can normally be reached on Mon-Fri (7:30a.m. to 5:00pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jinge Wu can be reached on 571-272-7429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jingge Wu/
Supervisory Patent Examiner, Art Unit 2624

Nancy Bitar

9/28/2008

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